

REMARKS

I. STATUS OF THE CLAIMS

Prior to the above amendment, claims 72-146 were pending. Without prejudice or disclaimer, claims 72-77, 84, 87, 88, 93-100, 103, 104 and 110-146 have been canceled. Claims 78 has been converted into independent format. In addition, claim 78 has been amended to incorporate the term "wherein said structural element has a dynamic elastic modulus not lower than 19 MPa when measured at 70 °C." Claims 89, 91, 101, 103, 105, 107, and 109 have been amended to depend from pending claims.

Support for the above amendments may be found throughout the as-filed specification and claims. For example, Section 112 support for the amendments to claim 78 can be found at Table 2, Examples 4 and 5, and page 9, lines 31-33 ("not lower than 5 MPa;" "from 8 MPa to 80 MPa"). As amended, the claims read solely on the embodiments disclosed in the specification, and thus, are supported. *Cf In re Wertheim*, 191 U.S.P.Q. 90, 97 (C.C.P.A. 1976) (rejecting claim for covering embodiments not disclosed in specification). Applicants submit that the amendments raise no issue of new matter.

II. RESPONSE TO CLAIM REJECTIONS

A. 35 U.S.C. § 103(a) rejection in view of Larson and Magnus

The Office rejects claims 72-96, 99, 101-115, 124-133, 136-144, and 146 under 35 U.S.C. § 103(a), as allegedly being unpatentable over EP 1 193 085 to Larson ("Larson") in view of U.S. Patent No. 5,238,991 to Magnus ("Magnus"). See Office Action, pages 2-5. Inasmuch as this rejection pertains to claims 72-77, 84, 87, 88, 93-96, 99, 103, 104, 110-115, 124-133, 136-144, and 146, it is moot, as those claims are

now canceled. With respect to pending claims 78-83, 85, 86, 89-92, 101, 102, and 105-109, Applicants respectfully disagree, and traverse the rejection for at least the following reasons.

1. The cited references do not teach or suggest each and every element of the pending claims.

In this Office Action, the Office essentially reiterates the arguments lodged in the non-final Office Action of December 31, 2008. Applicants understand that the Office alleges Larson teaches or suggests each and every element of claims 72-96, 99, 101-115, 124-133, 136-144, and 146, except for the claimed methylene donor and methylene acceptor compound. *See id.* To correct this deficiency, the Office relies on Magnus for the disclosure of methylene donor and acceptor compounds as “conventional additives.” *See id.* at 2. In particular, the Office asserts that one of ordinary skill would have found it obvious to add Magnus’ RF resin to Larson’s elastomeric compositions because they are “commonly used additive materials” used “to improve stiffness and adhesion with [reinforcing] elements. . . .” *See id.* at 2, 3, and 6. Applicants respectfully disagree for at least the following reasons.

First, the primary reference, Larson, does not teach or suggest the use of intercalated clay particles in either a tread under layer or tread base, as currently claimed. Rather, Larson expressly limits the applicability of these particles to the rubber/cord laminate (defined as the carcass and belt plies and not tread under layers or tread bases), sidewall inserts, and the apex. *See e.g.*, Larson at ¶ [0020]. Similarly, Magnus does not appear to teach or suggest this limitation.

Second, neither Magnus nor Larson (alone or in combination) teach or suggest a tire comprising, *inter alia*, at least one tread under layer and/or tread base having “a

dynamic elastic modulus not lower than 19 MPa when measured at 70 °C.” In fact, neither Magnus nor Larson (alone or in combination) teach or suggest elastic modulus characteristics for *any* structural elements described therein. Indeed, Magnus and Larson fail to provide even a general discussion regarding rubber compositions and the relevance of elastic modulus characteristics, let alone the specific dynamic elastic modulus recited in the pending claims.

Further, Applicants recognize that the Office alleges, in view of Larson, that “[i]t is well recognized that sidewall inserts (runflat inserts) and apex components (fillers) have high modulus values and high hardness values.” *Office Action* at 4. The Office also contends that “the claimed values are consistent with the properties conventionally associated with the aforementioned components.” *Id.* However, Larson does not teach or suggest the relevance of high modulus values and high hardness values with respect to a either a tread under layer or tread base, as currently claimed. In fact, as discussed above, Larson fails to provide any discussion with respect to the relevance of certain elastic modulus characteristics. Applicants therefore submit that the Office has not established that the cited references establish a *prima facie* case of obviousness with respect to any of the pending claims, at least because the cited references, whether considered alone or in combination, do not teach or suggest each and every element of the claims.

For at least the foregoing reasons, the Office’s 35 U.S.C. § 103(a) rejection over Larson, in view of Magnus, is not tenable and should be withdrawn.

2. One of ordinary skill could not have reasonably predicted the properties exhibited by an elastomeric composition comprising the claimed components.

In response to the non-final Office Action of December 31, 2008, Applicants argued, *inter alia*, that the properties exhibited by an elastomeric composition comprising the claimed combination of materials could not have been reasonably predicted by one of ordinary skill in the art from the disclosures Larson and Magnus. In support of this position, Applicants focused on the properties of five exemplary rubber compositions (*i.e.*, examples 1 through 5) discussed in Table 2 of the as-filed specification. See specification at 32. Specifically, Applicants noted that examples 2-5 (which contain layered material; methylene donor/acceptor compounds; a combination of layered material and methylene donor/acceptor compounds; and a combination of layered material, methylene donor acceptor compounds, and discontinuous fibers, respectively) each exhibit a significantly increased dynamic modulus (E') (at 23°C and 70°C) relative to example 1 (which contains no layered material, methylene donor/acceptor compounds, or discontinuous fibers). *Id.*, Table 2.

In view of the data presented, Applicants argued that nothing in Larson or Magnus suggests that a combination of layered material and methylene donor/acceptor compounds would act synergistically in a rubber composition to produce material properties that far exceed the expected sum of the individual contributions of each component. Notwithstanding those arguments, the Office renews its rejection of the pending claims under Section 103 in view of Larson and Magnus. In the instant rejection, the Office alleges that "one of ordinary skill in the art at the time of the invention would have been amply motivated to include a methylene donor and acceptor

[as disclosed in Magnus] in the tire composition of Larson.” *Office Action* at 7. In addition, the Office contends that “the fact that applicant has recognized another advantage . . . which would flow from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious.” *Id.* (emphasis added). As emphasized, the Office’s rejection presupposes that 1) the combination of Larson and Magnus somehow suggests combining a layered material with methylene donor/acceptor materials, and 2) the unique characteristics exhibited by the claimed combination are obvious and expected. For at least the reasons discussed below, Applicants disagree and traverse the rejection.

There is no basis in the record for the Office to alleged that “one of ordinary skill in the art at the time of the invention would have been amply motivated to include a methylene donor and acceptor [as disclosed in Magnus] in the tire composition of Larson.” As admitted by the Office, Larson merely teaches that “commonly used additive materials” may be used. Larson at ¶ [0047] In fact, the claimed methylene donors and acceptors are not identified specifically nor are they among the long list of exemplary classes of compounds. *Id.* Further, nothing in Magnus even suggests that its RF resins are “commonly used additive materials.” That is an unsubstantiated assumption of the Office.

Even assuming, *arguendo*, that a person of ordinary skill in the art would have been motivated to combine Larson and Magnus, Applicants submit that characteristics of the resulting combination are anything but obvious or expected. The claimed layered material and methylene donor/acceptor components act synergistically in a rubber composition to produce material properties that far exceed the expected sum of the

individual contributions of each component. Indeed, “[e]vidence of a greater than expected results may . . . be shown by demonstrating an effect which is greater than the sum of the effects taken separately (i.e., demonstrating “synergism”). See MPEP § 716.02(a), *citing Merck & Co., Inc., v. Biocraft Laboratories, Inc.*, 874 F.2d 804, (Fed. Cir.), *cert. denied*, 493 U.S. 975 (1989).

The synergistic effect of the claimed components is demonstrated by comparing the properties of examples 2 and 3 to the properties of inventive example 4. See specification at 35, Table 2. Consider the dynamic modulus (E') at 70°C, for example: while layered material alone (example 2) increased the value by 15.23% and methylene donor/acceptor compounds alone (example 3) increased the value by 32.0%, the combination (inventive example 4) increased the value by **110.9%**, which is substantially more than the additive effect of **47.23%**. *Id.* Applicants submit that this result, which is more than double the additive effect of 47.23%, would be surprising and unexpected to a person of ordinary skill in the art. Applicants further contend that person of ordinary skill in the art would appreciate that the operative temperature of a tire is close to 70°C, which further underscores the significance of the value for E' result at that same temperature in example 4.

Table 2 also demonstrates the unpredictable effect of the combination on tandelta, both at 23°C and 70°C.¹ Indeed, while the tandelta at 23°C of examples 2 and

¹ As explained by Larson, tandelta is well known to be a measurement of hysteresis. See Larson at [0062]. Lower tandelta correlates to reduced rolling resistance, which in turn relates to improved vehicular fuel economy. Thus, in regards to tire production, materials having lower tandelta are generally more desirable than those having higher tandelta.

3 show an *increase* in tandelta relative to example 1, the combination (inventive example 4) showed an unpredictable *decrease* in tandelta.

With this in mind, none of the cited references teach or suggest that an elastomeric composition exhibiting a combination of higher dynamic modulus and lower tandelta could be obtained by combining a diene with layered material and methylene donor/acceptor compounds, as claimed. See claim 78. Indeed, Larson discloses that the addition of layered material to a diene elastomer *increases* tandelta, relative to the unmodified diene. See Larson at ¶ [0062]. Moreover, Magnus is silent with respect to the impact of methylene donor/acceptor compounds on the tandelta of a diene elastomeric composition.

Thus, one of ordinary skill in the art could not have reasonably predicated from the cited references that an elastomeric composition comprising the claimed combination of materials would exhibit a combination of substantially increased dynamic modulus *and* lowered tandelta. Moreover, the Office has not explained *why or how* one of ordinary skill in the art would understand from Larson and Magnus that an elastomeric composition comprising the claimed components could exhibit both of these desirable properties in combination. For at least the foregoing reasons, Applicants submit that the Office's rejection of the pending claims under 35 U.S.C. § 103(a) is improper, and should be withdrawn.

3. The improved properties of the exemplary compositions cannot be attributed to differences in the amounts of natural rubber and/or carbon black.

a) Carbon black

The Office further alleges that it is “unclear if the realized benefits [of the exemplary compounds of Table 2] are a result of any one parameter or a combination of parameters.” *Office Action* at 8. Specifically, the Office suggests that because the amount of natural rubber and the amount of carbon black is varied between examples 4 and 5, and comparative examples 1-3, Applicants cannot attribute the improved properties of the claimed combinations specifically to components such as the layered material and the methylene donor/acceptor materials. *Id.* For at least the reasons discussed below, Applicants disagree and traverse the rejection.

With respect to carbon black, Applicants note that examples 1 and 2 comprise 70 phr and 60 phr of carbon black, respectively. See specification at 32, Table 1. Yet, examples 1 and 2 each comprise the same amount of amount of filler (*i.e.*, 70 phr), except for the substitution of 10 phr of carbon black in example 1 with 10 phr of montmorillonite in example 2. *Id.* However, while the substitution of montmorillonite into the composition of example 2 yields an improved (increased) tensile modulus (100% modulus) and an improved (increased) dynamic elastic modulus (E') at both 23°C and 70°C, it also yields inferior (increased) tandelta values at both 23°C and 70°C when compared to those measured for example 1. *Id.* at 35, Table 2. From this, it appears that the simultaneous improvement in E' and tandelta, as seen in examples 4 and 5, cannot be the result of an alleged synergistic interaction between carbon black and layered material (montmorillonite). If that were true, one would have expected to

see an increased E' and decreased $\tan\delta$ when replacing 10 phr of carbon black in example 1 with 10 phr of montmorillonite in example 2. This, of course, is not the case, as the composition of example 2 actually exhibits an increased (inferior) $\tan\delta$ at both 23°C and 70°C.

Similarly, Applicants also note that examples 3 and 4 comprise 70 phr and 60 phr of carbon black, respectively. *Id.* at 32, Table 1. Each composition comprises the same amount of methylene donor/acceptor materials. *Id.* Example 3 and 4 are identical except for the substitution of the 10 phr of montmorillonite in example 4 with 10 phr of carbon black in example 3. *Id.* Thus, if carbon black were responsible for improving the properties of the compositions through some synergistic effect with the methylene donor/acceptor materials contained therein, one would expect that example 3 (which represents the replacement of montmorillonite with carbon black) would exhibit superior properties when compared to example 4. Yet again, this is not the case. Instead, example 4 exhibits an improved tensile modulus (about +10%), and an improved dynamic elastic modulus (E') at both 23°C (about +50%) and 70°C (about +60%) with respect to example 3. *Id.* at 35, Table 2. Example 4 also exhibits improved values for $\tan\delta$ at both 23°C (about -8.0%) and 70°C (about -3.5%) with respect to example 3. *Id.*

A comparison of the results of example 1 and example 3, versus example 2 and example 4, further discredits the Office's contentions with respect to the role of carbon black in the unexpected results. Examples 1 and 3 are essentially identical, and contain the same amount of carbon black (70 phr), except for the fact that example 3 further comprises resorcinol and HMT. *Id.* The addition of resorcinol and HMT results in

improvements to E' (+50.14% at 23°C and +32.0% at 70°C), but poorer results for tandelta (+2.43% at 23°C and +8.17% at 70°C). *Id.* Examples 2 and 4 are essentially identical to examples 1 and 3, respectively, except 10 phr of carbon black in examples 1 and 3 have been substituted with 10 phr of montmorillonite in examples 2 and 4. *Id.* When compared to examples 1 and 3, however, the change in E' and tandelta between examples 2 and 4 is much more significant. Specifically, example 4 exhibits a dramatic increase in E' of about +76% at 23°C and about +83% at 70°C. *Id.* In addition, example 4 actually exhibits an *improved* (decreased) tandelta of about -14.3% at 23°C and about -13.5% at 70°C. *Id.* Hence, the substitution of 10 phr of carbon black in examples 1 and 3 with 10 phr of montmorillonite in examples 2 and 4 results in compositions that exhibit dramatic improvements in both E' and tandelta.

In view of the foregoing results, a person of ordinary skill in the art would likely conclude that carbon black plays no significant role (if any) in the simultaneous improvements to E' and tandelta exhibited by the compositions of the pending claims. Clearly, any synergistic effect undergone in the concurrent improvement of those properties takes place between other components of the composition (*e.g.*, montmorillonite and methylene donor/acceptor materials). As highlighted above, support for this conclusion is most evident when comparing the results of examples 1 and 3 with those of examples 2 and 4.

b) Natural rubber

With respect to examples 4 and 5, Applicants respectfully submit that the Office has misinterpreted the amount of natural rubber comprising each of those compositions.

Specifically, while example 5 only contains 93.3 phr of natural rubber (NR), it also contains 8.7 phr of Kevlar[®] elastomeric component, an ingredient that is not included in the composition of example 4. See specification at 32, Table 1. As noted in the specification, the Kevlar[®] elastomeric component of example 5 comprises a blend of 23% by weight of Kevlar[®] and 77% by weight of natural rubber. See specification at 33, lines 1-3. As a result, natural rubber comprises about 6.7 phr (of the 8.7 phr) of the Kevlar[®] elastomeric component in example 5, while the remaining 2.0 phr comprises discontinuous fibers (*i.e.*, Kevlar[®]). Therefore, contrary to the Office's assertions, the example 5 composition actually comprises a total of 100 phr of NR (93.3 phr from NR and 6.7 phr from Kevlar[®] elastomeric composition). Accordingly, any improvement in properties observed between examples 4 and 5 cannot be attributed to a difference in NR content, as each composition comprises the same amount of NR. The same can also be said for all of the compositions described in Table 2, as each of examples 1-5 comprise 100 phr of NR.

In sum, the results of Table 2 demonstrate that any improvements in performance observed for each of the exemplary compositions should not be attributed to carbon black and/or NR content. For example, the improved E' and tandelta for example 4, when compared to example 3, can be attributed to a synergistic effect between other components in the composition, such as the layered material and the methylene donor/acceptor. Similarly, the improved performance of the example 5 composition, when compared to example 4, can be attributed the addition of 2.0 phr of Kevlar[®], as each of those compositions comprise the same amount of carbon black and natural rubber. Thus, contrary to the Office's assertions, the improved performance of

examples 4 and 5 can be confidently attributed to component factors *other than* natural rubber and carbon black.

For at least the foregoing reasons, Applicants submit that the applied 35 U.S.C. § 103(a) rejection of claims 72-96, 99, 101-115, 124-133, 136-144, and 146 under 35 U.S.C. § 103(a) as being unpatentable over a combination of Larson and Magnus is improper, and should be withdrawn.

B. 35 U.S.C. § 103(a) rejection in view of Larson, Magnus, and Brown

The Office also rejects claims 97, 98, 100, 116-123, 134, 135, and 145 under 35 U.S.C. § 103(a) as being unpatentable over a combination of Larson, Magnus, and U.S. Patent No. 4,871,004 to Brown ("Brown"). Applicants respectfully disagree and traverse this rejection for at least the following reasons.

Without acquiescing to the Office's arguments and characterization of the claims and prior art, Applicants have canceled claims 97, 98, 100, 116-123, 134, 135, and 145 without prejudice. Accordingly, Applicants submit that the Office's rejection of those claims under 35 U.S.C. § 103(a) is rendered moot, and should be withdrawn.

III. CONCLUSION

In view of the foregoing amendments and remarks, Applicants respectfully request reconsideration of this application and the timely allowance of the pending claims.

Please grant any extensions of time required to enter this response and charge any additional required fees to Deposit Account No. 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

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By: 

Jeremy S. Forest
Reg. No. 62,827
(650) 849-6655